FAA AVIATION NEWS

NOVEMBER 1968

COVER

Canada geese, ducks, and other migratory waterfowl, are now on the wing in large numbers headed for winter quarters. For details on this twice-yearly hazard to flight, see page 3.

FAA AVIATION NEWS

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DUCK— IT'S A BIRD!

Pilots' Attention Called to Fall Migration

Responding again to the mysterious prodding of an instinctive timetable, millions of ducks, geese, swans and other large waterfowl left their northern breeding grounds in mid-October, enroute to winter quarters along the Gulf of Mexico and the Chesapeake Bay area. The fall migration is now at its peak, and this serious hazard to aircraft in flight will continue until December.

This is particularly true along the Mississippi flyway, which cuts a broad swath from the Dakotas to Pennsylvania, and south to the Gulf of Mexico from Texas to Florida. About a million of these migrating birds will ignore the lure of the sub-tropic Gulf Coast and cut across the northern part of the flyway to winter around the Chesapeake Bay area in Virginia, and the Currituck Sound and Lake Mattamuskeet area in North Carolina.

The kinds of birds, their flight characteristics, peak migration dates and numerous detailed charts and graphs showing where and when the bird movements are heaviest are contained in a recent FAA-contracted report on migrating birds in the Mississippi flyway.

Waterfowl begin their nocturnal journeys soon after sunset, and as the night deepens, ever-increasing numbers join in. These usually are long-distance hops, between lakes and marshes. The hazard does not vanish with the dawn—ducks continue to fly during the early morning hours until a favored water area is reached.

Of particular importance to general aviation pilots, who normally cruise at the lower and medium altitudes, is the relatively low altitude where migrating birds are encountered in greatest numbers. The report states that at Havana, Ill., Weather Bureau radar (capable of measuring target altitude) spotted 40 per cent of the duck targets below 3,500 feet (MSL). Only a few flocks were observed as high as 9,500 feet (MSL). Information derived from pilot reports showed only 25 per cent of migrating geese above 5,000 feet (MSL), with the bulk of them between 2,850 and 5,000 feet.

The report pays specific attention to the hazards of waterfowl flight to aircraft in the vicinity of important civil airports in the Mississippi flyway.

It is estimated, for example, that some 3,000,000 ducks pass within a 40-mile radius of St. Louis, plus about 20,000 to 30,000 blue, snow and Canada geese during the fall migrating season. *The periods of greatest hazard are between October 15 and November 30, and again between March 1 and April 10.*

Kansas City and Omaha, both on the Missouri River, are overflown in the spring and fall by an estimated 1,000,000 ducks during the migrating seasons. In addition, some 200,000 blue and snow geese pass through the same area in the fall; in the spring the number swells to 400,000.

The flight path stretches out to about a 40-mile radius of these two cities. *The heaviest traffic is between October 15 and November 30, and from February 20 to March 20.*

The period of greatest hazard for the area around Chicago and Milwaukee extends from *October 1 through December 20 with a surge about mid-October and another early in December. During their return flight in the spring, migrating birds in this area are most numerous between March 10 and April 1.* The study reported that from 100,000 to 150,000 Canada geese and perhaps 20,000 to 40,000 blue and snow geese pass to the west of Chicago and Milwaukee on their way south. Most of these skirt General Mitchell Field, Milwaukee, by 30 to 50 miles to the west, and range 25 to 70 miles west of O'Hare International, Chicago.

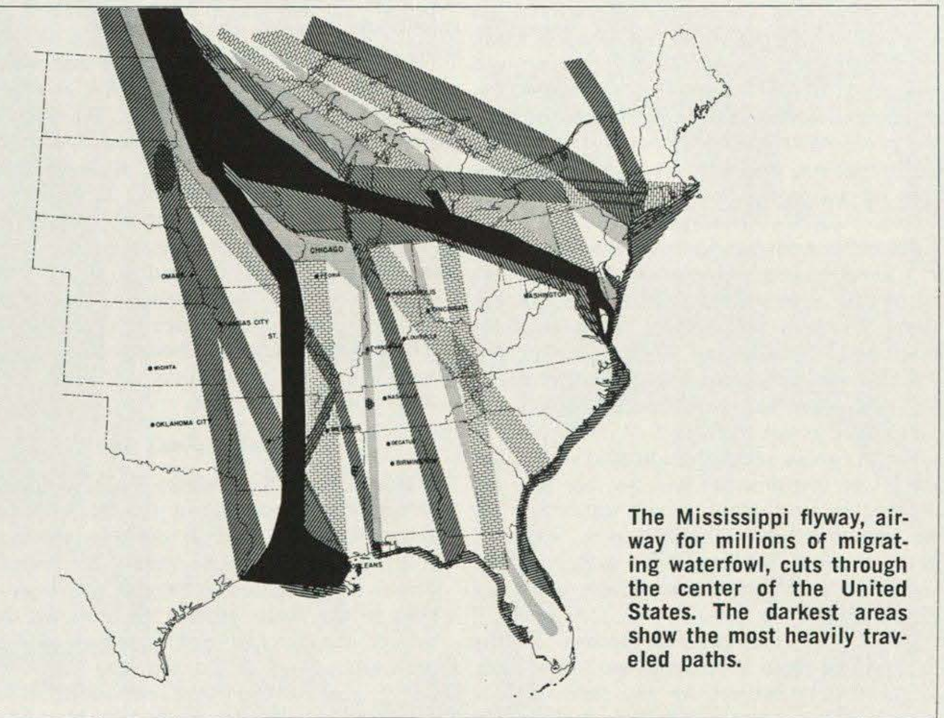
The Detroit area, particularly the Detroit River, Lake St. Claire, and western Lake Erie, attracts from 600,000 to 1,200,000 ducks each fall, plus an additional 5,000 geese which pass Detroit about 20 miles to the west. A large proportion of the 50,000 whistling swans bound for the Chesapeake Bay area passes through the Detroit area in the fall and spring. Many of these birds are also seen near Cleveland.

Duck flights present the greatest hazard between October 15 and November 15, and March 15 to April 15. For Canada geese, the period of greatest danger is between October 1 and November 1, and March 15 through April 10. For swans: October 20 through November 20, and March 15 through April 10.

In the Minneapolis-St. Paul area, 500,000 ducks and unknown numbers of whistling swans make the Mississippi River a port of call on their way to and from winter quarters in North Carolina. *Seasons of greatest hazards from ducks: October 10 through November 15, and March 20 through May 1. For swans: October 10 through November 10, and March 20 through April 15.*

Copies of the report "Establishing Certain Parameters of Hazards to Aircraft by Migrating Birds in the Mississippi Flyway," (AD 662 413), are available for $3 each from the Clearinghouse for Federal Scientific and Technical Information (CFSTI), Springfield, Va. 22151. Orders should include title and "AD" number and a check or money order made payable to CFSTI.

Additional information on bird migration is contained in Part 1, *Airman's Information Manual.* ■



The Mississippi flyway, airway for millions of migrating waterfowl, cuts through the center of the United States. The darkest areas show the most heavily traveled paths.

How High Am I?

A Determined Mechanic Overcomes the Obstacles to Field Testing Altimeters

Left—Des Moines Flying Service, first in the Midwest to be FAA approved for altimeter inspection. Right—To insure maximum accuracy, the instrument shop floor was surveyed to determine its exact elevation, and barometric pressure obtained daily from the weather station.

(Editor's Note: Robert M. Garmon, Des Moines Flying Service, was the 1968 national winner and recipient of a $500 cash award, a trip to Washington, D.C. and other honors in FAA's Fifth Annual Aviation Mechanic Safety Award Program. Mr. Garmon was selected under new criterion established last year: "... For the consistent demonstration of a high level of professionalism" in the performance of his duties as an aviation mechanic. Specifically noted was his work in perfecting a procedure for testing and checking altimeters and static systems. In the following article he describes how the problem of altimeter testing attracted his attention, and how he went about the task of solving it.)

Pilots have always known how important an accurate altimeter is, but until recently few airmen ever had them tested regularly. Portable testers had not been fully developed, dismounting the instrument for overhaul or replacement was a costly process, and few fixed base operators had the equipment to test it fully.

When gross errors indicated malfunction, the instruments had to be sent to certificated instrument repair stations or to the manufacturer. Trouble was, often a "trip" through the mail was sufficient reason to again question instrument accuracy upon return.

Even after the portable testers of the past decade were developed, we knew these devices were subject to the same errors found in altimeters installed in aircraft. There had to be a way of assuring the accuracy of the reference altimeter, a part of the portable tester, in order to perform a true test.

During 1966, many incidents attributable to faulty altimeters or static systems occurred in aviation, and we could see that FAA would soon require general aviation aircraft pilots who fly IFR to test their altimeters at regular intervals. Such a proposed rule was issued in August, 1966. This met with such resistance from industry (because so few facilities were equipped to perform these tests), that FAA moved up the deadline to August, *1967*. At this time, no guidelines had been issued for maintenance shops like ours that were interested in tooling up or developing testing procedures to qualify for altimeter testing.

Barometry and altimetry had always interested me, so I decided to work out a system whereby our company, Des Moines Flying Service, could meet this anticipated FAA requirement. It became not only a company project, however, but also a personal challenge.

Inspection Procedure

If altimeters and static systems were to be routinely checked in the field, a portable device designed to develop a controllable negative pressure would be required. The aviation mechanic would attach an air hose to the static system vent on the exterior of the aircraft and withdraw a measured amount of air to simulate pressure at 1,000 feet above test elevation. If the altimeter remained within 100 feet of the simulated altitude after one minute, it would be considered within tolerance, and the aircraft static system considered operative. If not, the mechanic would have to check for leakage, blockage, etc., and make the necessary repairs.

The altimeter itself was tested by going into the cockpit, detaching the static system line leading to the altimeter, and attaching the air hose part of the portable tester to the altimeter. Measured amounts of air were withdrawn to simulate specified altitudes. The altimeter would be compared with the one in the portable tester at each interval. If the altimeter read within tolerance, as specified by FAR 43, Appendix E, it would be certified.

If not, the instrument could only be repaired by a certificated instrument repair facility. (In the case of Des Moines Flying Service, we were not certificated to do this work, so I would replace a malfuctioning instrument with one that was within tolerance.) These are only a few of the many exacting tests required by FAA.

The testing procedure sounds simple and straight-forward, but in reality nothing is simple when you are dealing with altimeters. This is partly because barometric conditions are never the same from day to day, or even from hour to hour, and partly because the environment of flight itself is so changeable. For example, engine vibration affects the altimeter to some extent, causing internal friction. While testing the altimeter, vibration can be simulated by tapping the altimeter with the finger tips. If the difference in the readings before and

after vibration are within tolerance, the altimeter is considered acceptable.

Temperature is an important factor. Unless the altimeter testing is done within a controlled temperature range, inaccurate readings may result in an invalid test. Incidentally, pilots should know that during cold weather, a preflight barometer setting should not be made until the cabin temperature has reached 60 to 70 degrees Fahrenheit. This is due to the fact that altimeter adjustments are normally made at room temperature.

Elevation is another variable that must be controlled. It is not enough for purposes of altimeter testing, or pre-flight setting, to know the elevation of the terminal building. At a large airport, the elevation on various runways may vary as much as 100 feet. Even a 20-foot variation could be critical.

Barometric pressure can change very suddenly. At times when weather changes are rapid, I have personally observed the barometric pressure to cause an altimeter to change as much as 60 feet from its previous setting within a few minutes. (This is why an accurate setting prior to takeoff is so vital for the pilot, especially when flying on instruments or at night.)

I realized that to check altimeters accurately I would need to establish a testing area relatively free of atmospheric contamination and not subject to extreme temperature and humidity changes. In addition, I would need the precise daily barometric pressure and the precise elevation of the shop floor.

We had the shop floor professionally surveyed with reference to the nearest Coast and Geodetic Survey bench mark. With the daily barometric pressure provided by our local weather station, I was able to verify the accuracy of our company's portable testing equipment each day before performing any tests.

Detailed Checklist Set Up

I next drew up a checklist to use as a guideline during the testing process and to serve as a statistical record of each job for our company files. This list included every conceivable variable which might affect an altimeter reading.

After I had worked out my procedure, the local FAA Avionics and Maintenance Inspectors came out to review my project. For two days we studied my test procedures and the records I had kept until they were satisfied with the program, and convinced that I could reliably check altimeters in the aircraft.

By this time, March 1, 1967 had arrived and Des Moines Flying Service became the first fixed base operator in the area to be certificated to perform these tests. We were very pleased.

Some time after this, my name was entered in the FAA Aviation Mechanic Safety Award competition with the development and documentation of this altimeter and static system test submitted as an example of my work.

I never dreamed I would be the national winner, even after I was named winner for the State of Iowa and the FAA Central Region.

Besides receiving the FAA state plaque at the Governor's Office, I was presented with a $100 check and a handsome engraved ash tray from the Iowa State Aeronautics Commission.

As the national award winner, my family and I were flown to Washington, D.C. where I was given a $500 cash award and a beautiful framed medallion.

I also received a $150 check to cover my expenses in Washington, a limousine tour of the city and many other gifts.

This has been a wonderful experience for me. It has also created a great deal of interest in maintenance in our community.

One of the most enjoyable fringe benefits resulting from the award publicity has been the mail and phone calls from my friends everywhere in all phases of aviation. Some I have not heard from for as long as 20 years.

I plan to use part of the cash award money to cover my expenses while attending FAA's Academy in Oklahoma City during my vacation next spring. This tuition-free course is also part of the award: I have enrolled in a two-week course entitled "Introduction to Jet-Powered Executive Aircraft."

I will be the first to acknowledge that, at best, I have only "scratched the surface" of altimeter testing, but I sincerely hope that my efforts will, in some small way, prove to have been a contribution to the goal we all strive for—*greater air safety.*

Robert M. Garmon

Above—Using a portable tester, Robert Garmon checks the accuracy of an altimeter in the aircraft.

Right—Garmon reaches for static pressure system meter in spic-and-span shop. Instrument work, demands rigorous cleanliness in methods, shop and tools.

Below—Garmon, with Supervisor Mace A. Coolley, goes over testing procedure checklist. Coolley recommended Garmon for the FAA award.

Typical of the new generation of professional flight instructors is Thomas L. Oneto, who operates out of Dulles International Airport. He is using his hands to clarify a point in turn procedure to a young student. U.S. has some 44,200 flight instructors.

NAFI FLIGHT INSTRUCTORS GO PROFESSIONAL

The day of the devil-may-care, poorly trained and casually dressed flight instructor who did business in a worn leather jacket and oil stained trousers has all but come to an end. And good riddance, say officials of the National Association of Flight Instructors.

Now a year and a half old, NAFI has a membership of more than 1,200 and it is growing at the rate of 50 a month. Ideally, NAFI would like to see all of the nation's 44,421 flight instructors gathered under its wing.

(The ranks of flight instructors are growing at a rapid rate. In 1967, FAA issued 8,791 certificates, 6,062 of which were original issuance, and 2,729 were added ratings. This represents an increase of 55 per cent above the 5,655 issued in 1966.)

The association's product is safety: teaching pilots to *fly right,* right from the start. NAFI plans to do this by raising the professional status of its members to that enjoyed by other groups where standards of training, discipline and performance are traditionally high.

To do this, NAFI has set itself up as a central point where knowledge, methods of training and new information relating to flight instruction can be freely exchanged. In addition, it actively consults and cooperates with FAA for improved legislation concerning pilot training, certification and aviation regulations. NAFI works with all segments of the aviation industry to improve flight education, efficiency and safety, and it encourages interchange of ideas with other flight instructors through informal, day-to-day contact and formal educational programs.

High on NAFI's priority list is how to provide adequate before-flight and after-flight periods where the instructor and the student can plan the flying session and discuss what transpired over a post-flight cup of coffee.

"The cockpit of a plane in flight is just about the worst possible place to discuss theory of flight," say NAFI officials.

Traditionally, flight instructors are paid "tach time" only. That is, their pay for instruction starts when the engine turns over, and ends when the engine is shut down. The student is ushered out of the airplane to make room for another. In the process, he may be left standing on the ramp with a head full of questions. The instructor, for his part, wishes he had the time to go over the flight and provide helpful suggestions. The National Association of Flight Instructors hopes to do something about this.

The founding fathers who formed NAFI at a general aviation meeting in Las Vegas in November 1966, are all thoroughly qualified flight instructors. They are also all high-time pilots who trace their careers back to wood and fabric airplanes, held together by a forest of struts and guy wires. The President, Rev. Raymond E. Lanham, is the Chaplain at Methodist Hospital, Indianapolis, Ind.

The 1st Vice President, Ralph F. Nelson, is a Vice President of the Aircraft Owners and Pilots Association. Riley K. McGraw, NAFI's 2nd Vice President, is a retired airline captain, and NAFI secretary Harry L. Riggs, Jr., is a public prosecutor in Erlanger, Ky. The treasurer, L. Arthur Cushman, is a fixed base operator in Patterson, N. Y.

Among the directors are a university professor who heads the department of aviation at his school, a retired USAF colonel, an airline chief pilot, a fixed base operator, and a director of training at a major aeronautical institute.

The Executive Director, James E. Stargel, is a retired District of Columbia police inspector, who began flying in 1936 and has logged over 4,000 hours.

Earlier this year, the National Association of Flight Instructors adopted an eight-point code of ethics that should go a long way toward improving safety, enhancing flight instruction and elevating the flight instructor to professional status. The code pledges that each NAFI member will:

- Perform his professional service always for the good of the student.
- Provide the best possible instruction according to accepted techniques and standards.
- Deem as confidential the student/instructor relationship, releasing information concerning the student only as it benefits the student, serves professional purposes, or is required by law.
- Maintain his own professional qualifications and continually improve his skill as a Flight Instructor.
- Treat with respect his fellow instructor.
- Give appropriate support to those persons and schools engaged in flight instruction.
- Uphold the Federal Aviation Regulations in both personal and professional practices.
- Refer to the appropriate authority any deficiencies or circumstances which jeopardize the quality of flight training.

NAFI officials stress the point that the association is not a pressure group or a labor union, but a professional group. NAFI President Lanham, in a letter to a new member made the point ". . . that those who want to be professionals can join this professional association whose aim is to police its own profession, set its own standards, improve its own performance and be responsible in its own field."

Membership is open to all certificated flight instructors. For details, write to: James E. Stargel, Executive Director, National Association of Flight Instructors, Box N, Washington, D. C. 20014. ■

Mountaineering
For Flatland Pilots

PERSPECTIVES II

Second in a series of instructive hints on the use of perspective sighting in estimating the relative positions of aircraft and landmarks. For determining a safe VFR course of flight, there is no finer, more dependable instrument than the human eye, when used correctly.

Mountain flying can be deceptive, especially for the inexperienced flatlander. The question of whether you are flying at an altitude that will carry you safely over peaks on your course should be determined before you run out of maneuverable airspace.

Although it is usually possible to identify mountain peaks by their location on the chart, and to fly at an altitude at least 1,000 feet higher than their known elevation, the possibility of human or instrument error always exists. In the interest of safety, pilots flying over mountainous terrain should form the habit of using the horizon as a visual checkline.

When the approaching aircraft is in level flight, it will pass easily over any peak which is seen clearly below the horizon. If the mountain top is *near* the horizon, its elevation will correspond to the altitude of the aircraft. If the mountain juts up clearly over the horizon, it is well above the approaching aircraft. ■

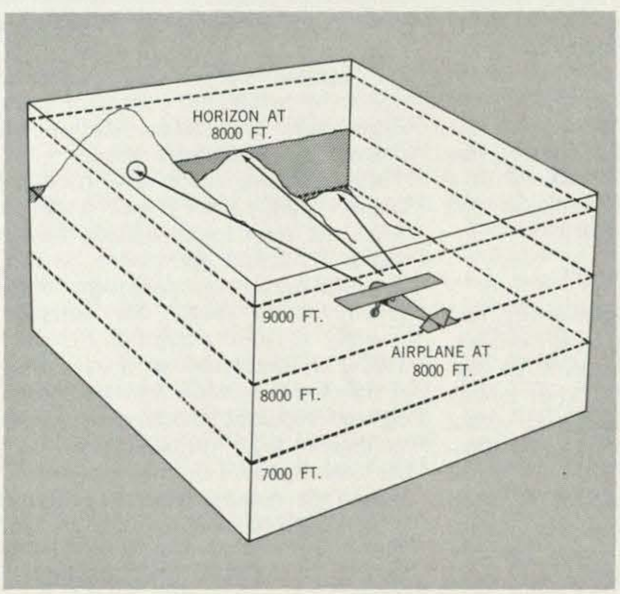


Diagram shows how silhouette of mountain peak on horizon determines relative height of the peak. Only the mountain at right may be safely flown over without a change in altitude.

Up, Up, and -

Flight service station personnel are the sort of people who go looking or listening for trouble. That is why the crew at FAA's Roswell, New Mexico, Flight Service Station happened to listen in on a conversation between a 14-year-old boy and his father one day last summer. The unscheduled eavesdropping resulted in an unusual flight assist, not likely to be forgotten by the teenage pilot.

The boy was Neil Muxworthy and he was speaking from the cockpit of a single-place *Sisu* sailplane about 10,000 feet in the air. His father was using the radio in his car as he attempted to follow his son on a cross-country sailplane flight from Odessa, Texas to Roswell, New Mexico.

In an effort to avoid rain squalls, Neil had drifted off course and lost his bearings. Prompt action on the part of the flight service station personnel at Roswell prevented a possible tragedy, as distance finding equipment and an airborne guide were utilized to lead the young pilot to a suitable landing area.

Inhospitable terrain, radio failure, and a line of active thunderstorms, all figured in the tense drama that lasted almost an hour, the final hour of a nearly five-hour soaring saga.

The first alarm came at 4:47 on a hot mid-June afternoon when the swing shift at the Roswell, N.M. Flight Service Station was just settling into a familiar routine. Watch supervisor John Hayes and Flight Service Specialist Timothy J. Kelly, each with more than 10 years of FSS experience, sipped coffee and checked NOTAMS, current weather, forecasts and trends, winds aloft, and the status of NAVAIDS in their flying area. The radio provided a background of voice communications and static.

A dialogue on one of the channels caught the attention of Hayes and Kelly: a sailplane pilot was reluctantly coming to the conclusion that he was lost. None of his checkpoints were in sight, he radioed to a contact on the ground. Kelly broke in and soon picked up the whole story.

Sought "Diamond Goal"

The youthful pilot, Neil Muxworthy, had soloed in a sailplane on his 14th birthday, the earliest day permissible under FAA regulations. Several months later, after having logged nearly 60 hours in sailplanes—dual and solo—he was ready to try for the "Diamond Goal," an award given out by the Soaring Society of America for a cross-country solo flight of 300 kilometers (186.4 miles) to a pre-designated goal. Preparations for this cross-country flight were made for June 14, starting from his hometown airport at Odessa, a small town in western Texas.

Neil was off the tow at 2:04 p.m. and headed for Plains, Texas, about 100 miles to the north, on the first leg of his flight. The original plan called for Neil to be followed by another sailplane pilot, Wally Scott, in a similar aircraft. Because of weak thermals directly after coming off the tow, Neil became separated from Scott and soon realized that he would have to continue the flight on his own.

However, he was not entirely alone. His father had hooked up the sailplane trailer to his automobile and was endeavoring to accompany him overland, maintaining radio contact as far as possible. Neil was piloting a high-performance sailplane, the *Sisu-1*, equipped with a Bayside 990 transceiver giving him a radio range of 50 miles at 10,000 feet.

His other instruments included an airspeed indicator, an altimeter, a compass and two variometers (sensitive instruments for use in sailplanes to indicate rapid change in the rate of climb and detect changes in thermal currents). The only fuel required in the sailplane, of course, was to stoke up the inner man. This consisted of a jug of water and a bag of sandwiches.

Runs Into Storms

Neil had no difficulty on his flight up to Plains, and after taking the required photographs of the town he headed for his final objective, Roswell—approximately 100 miles to the west. His father had arrived at the turnpoint at about the same time as the sailplane and radio contact was maintained.

The terrain in the direction of Roswell was essentially flat—barren, semi-desert land broken by occasional swaths of cotton and wheat, with few towns. Roswell itself is located along the Pecos River.

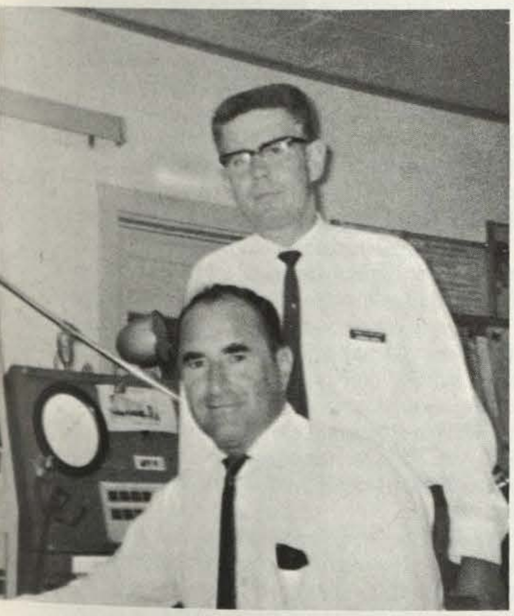
After passing over the checkpoint of Tatum, N.M., Neil passed under a dark cloud and soon found himself rising at the rate of 1,100 feet per minute. At this point, he observed a large rainstorm to the west directly on his course. Neil altered course in order to pass around the cloud. Afterwards, he discovered an increasing number of rainclouds en route which required dodging and repeated alteration of course. The air became fairly turbulent and Neil pushed the *Sisu* up to 110 mph in order to get around the thunderstorm area more rapidly.

He had intended to pick up the Pecos River and follow the north-south road adjacent to it into Roswell, but the river

Above—Young Neil Muxworthy flew to high adventu Confident and competent, Neil poses beside his Sis fuselage 20 feet, 10 inches in length, an empty weigh foot of sink. Below, right—Timothy J. Kelly (seated) a age pilot to a happy landing. When they located th

Vhere Am I ?

e in a Sisu sailplane like this one. Below, left—
ı. The graceful craft has a wingspan of 50 feet, a
t of 520 pounds and can glide over 40 feet for each
d John Hayes played key roles in guiding the teen-
lost pilot he was headed in the wrong direction.



was not in sight. The rainstorms became more vicious, with frequent lightning, and the 14-year-old pilot felt frightened and confused. Realizing that he was in fact lost, and aware of the hazards that could arise if he drifted into the mountainous area to the west, were peaks of the southern Rockies jutted over 12,000 feet, he contacted his father on the radio and asked for help in locating his bearings.

Neil's father, Dr. John S. Muxworthy Jr., also a pilot, tried to give his son a heading that would bring him in sight of the car, now traversing the highway to Roswell. Neil was unable to follow the suggestions, however, as he was surrounded by rainstorms which he was reluctant to pass through or under. It was at this point that the Roswell Flight Service Station cut in on the radio and began to provide the lost youth with professional guidance.

Neil was able to identify his aircraft to the flight service station and reported that he was at 10,000 feet with satisfactory thermals, but he was surrounded by rain squalls with repeated lightning and he had no idea where he was. With doppler direction finding equipment, FSS specialists Hayes and Kelly quickly located the lost sailplane at a point 25 miles to the east of Roswell and headed in the wrong direction.

Concerned About Thermals

In spite of their lengthy experience in air traffic control work, neither Hayes nor Kelly had had any experience in vectoring sailplanes. In order to bring young Muxworthy back on course, a 180 degree turn would be required—a simple procedure for an aircraft under power. However, Hayes and Kelly were concerned that this course of flight might take the sailplane out of the more favorable thermals and perhaps cause it to lose lift and eventually force it to a landing in rough terrain. Therefore, Neil was vectored via an area of open fields near Roswell which would provide him with more favorable forced-landing terrain en route to the airport.

In spite of his anxiety over the lightning and being lost, young Neil remained calm at the controls and responsive to communications from the flight service station. He reported the rain squalls that came on his course and moved skillfuly from thermal to thermal in order to maintain altitude, while Hayes and Kelly described geographical landmarks to help the youthful pilot find his bearings.

Abruptly, however, radio communication from the sailplane weakened and finally was lost altogether. Not wishing to abandon Neil, the flight service station requested assistance from the pilot of a Piper *Apache* that had just departed Roswell Airport. They vectored the *Apache* to the last known position of the sailplane, and visual and radio contact was made about 12 miles out of Roswell as Neil was descending in fairly dead air, having just left the rainstorm area.

The *Apache* was throttled back and circled around the sailplane until Neil spotted the airport.

Stretching the Glide

At this point, being out of the thermals and descending fairly rapidly, Neil had to decide whether or not he could actually glide to the airfield with his altitude remaining. The terrain under him consisted essentially of brown wheat fields and looked landable, but having come this far, he wanted to make the airport if he could possibly stretch his glide.

About a mile from the runway, he concluded that he could not clear the threshold, and he began to search for an emergency landing area. He dropped his landing gear at about 100 feet in the air and lowered his flaps. The wheat fields were surrounded by fences, so he decided to try for an abandoned golf course he spotted nearby. In another moment he glided to a stop without injury to pilot or damage to the craft. The *Apache* flew over the landed sailplane and informed Roswell tower that young Muxworthy was down and safe.

After radioing his thanks to the *Apache* pilot for his assistance, Neil climbed out of the cockpit and walked through the wheat to a nearby road, where he was eventually joined by his father and fellow soarer, Wally Scott.

According to the stop watch, Neil had been airborne 4 hours and 56 minutes, having landed at approximately 7 p.m. He was a little disappointed that he hadn't quite qualified for the five-hour duration badge of the Soaring Society of America, but he had the satisfaction of knowing that he had completed the "Diamond" requirements for distance in a cross-country flight, and he was eager to thank all of the flight service station personnel for their assistance.

FSS specialists Kelly and Hayes, reflecting on their experience in vectoring a pilot who was unable to follow a direct course but had to hop from thermal to thermal and skirt heavy weather at the same time, agreed that powered aircraft were much simpler to handle than sailplanes. Still, they'll handle whatever comes their way.

Lewis Gelfan

Pictorial Display (oblong device above instrument panel) uses VOR/DME inputs to move map and vertical bar which pinpoints exact location of the aircraft at all times.

"COPING WITH THE FUTURE"

While more airports will relieve congestion on the ground, the airspace above airports is obviously restricted. To handle more airplanes within a terminal area, we must be able to manage closer spacing of aircraft.

There are several things we shall have to do to make this possible. As a beginning, we are already extending what we call *positive control* of airspace. Only about one-quarter of all the thousands of aircraft in daily flight are operating under instrument flight rules (IFR) in an environment in which aircraft altitude and course are controlled by the air traffic control system. FAA is now considering a plan to reorganize the airspace structure so that aircraft landing at major airports are all on instrument flight plans or under air traffic control.

To accomplish this, we would mark out a funnel-shaped environment over high density airports as a positive control area, used only by properly instrumented aircraft. Under favorable weather conditions, other aircraft would be permitted to penetrate this controlled airspace.

Knowing the exact speed, location, altitude and intention of all aircraft in the positive control area over the airport, the tower controllers could move aircraft in and out of the airport at much shorter intervals without jeopardizing safety.

Computer Role Expanded

We are also counting on *automation* to increase the efficiency of our air traffic control system. Information regarding the movements of aircraft and weather is passed along through this system by phone, radio and teletype, to controllers who then make decisions affecting traffic in their area. We also use computers to exchange data between centers, as well as to make many calculations formerly made by controllers, such as computing estimated time aircraft will appear at a given point, with such factors as airspeed, wind direction and speed, etc. all considered. We intend to install more effective computers which will analyze such information far more swiftly and read out an answer to the controller almost before the question is keyed in. A new computer recently installed in our Cleveland center will process over 500 flight plans per hour.

At controlled airports we hope to install what we call *computer-aided approach sequencing*—radar linked computers that will schedule the flow of inbound traffic at shorter intervals than is possible when monitored by the human eye.

Closer spacing of aircraft, however, is limited by the accuracy of our navigational and surveillance instruments. Our surveillance is accomplished by radar, which locates the aircraft only approximately. The light blip on a radar scope represents an airspace one to one-and-a-half miles in length. The aircraft could be in the dead center of the blip, or near the circumference.

Furthermore, the sweep of airport radar antenna occurs once every two seconds. After each sweep, the light blip appears to hop forward. In fact, of course, we know that the aircraft's movement is more nearly uniform. Consequently, when two blips are seen moving in close proximity, the aircraft could actually be only a mile-and-a-half apart—or they could be four or five miles apart, by exact measurement. This is one of the limitations of radar surveillance with regard to close spacing of aircraft.

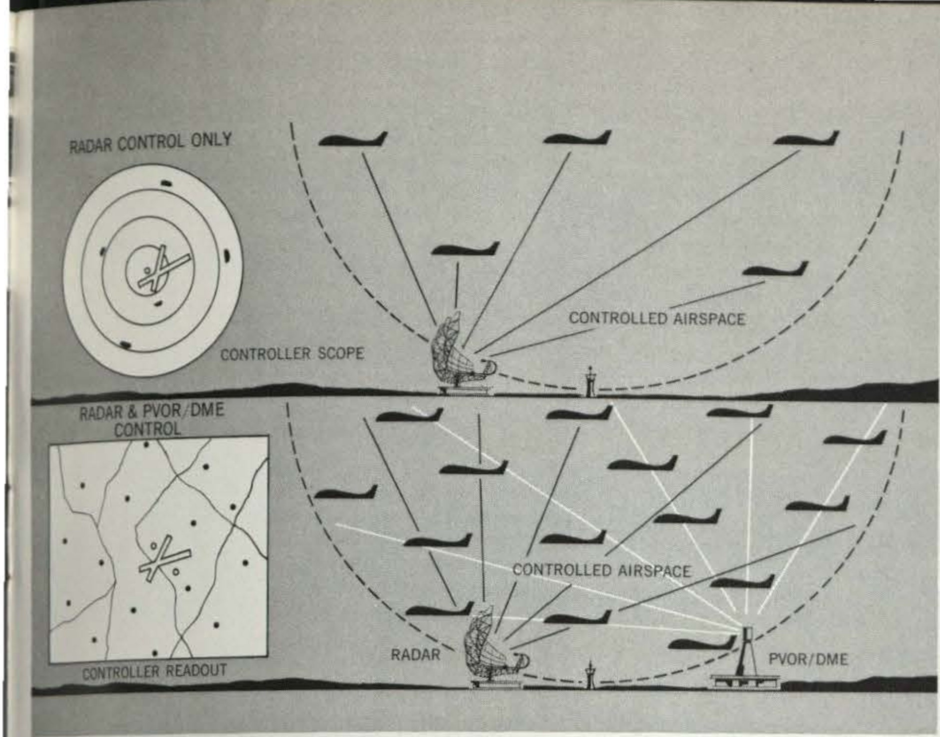
Pinpointing Plane Position

Another limitation of radar is its capacity. As the scope becomes crowded with targets, with perhaps as many as a hundred displayed at one time, it becomes difficult for the controller to monitor aircraft under his guidance with certainty. We are going to need a more precise system of aircraft surveillance for our controllers.

We also need a more precise means of informing the pilot of his location than is currently offered by our common navigation system—the VOR. In contrast to radar, the signal from the VOR antenna does not simply bounce back from the aircraft, but is received by sensitive equipment in the aircraft, and displayed in the cockpit as a bearing from the antenna. By tuning in any given frequency, the pilot is able to fly to or from a VOR antenna without difficulty. If his VOR receiver needle moves to one side of center, the pilot simply alters his course until it is centered again. By taking two or more bearings, it is possible for the pilot to calculate the exact location of his aircraft. The position can be calculated even more quickly if, in addition to a VOR azimuth, a reading is taken with *distance measuring equipment*, which all fully instrumented aircraft carry. However, by the time the information has been relayed, the aircraft may be 10 or 20 miles beyond the reported position.

If we used a small electronic computer on board the aircraft to convert this information into digital form, the digitized data could be relayed to the ground in a fraction of a second and converted again by computer to a visual display which the controller could comprehend in literally the blinking of an eye. The digitized data could be sent on the same voice channel over which the pilot communicates with the controller, or on a DME or on any other available channel.

The location of the aircraft could be displayed to the controller with far greater accuracy than is possible today. The controller could utilize a large scope or any



Artist's conception shows how closer spacing of aircraft within a high density terminal area might be achieved with area navigation. Location of aircraft could be observed by means of Precision VOR (PVOR) signals fed to computers in the aircraft, relayed to other computers in the control tower, and displayed on a large scale readout. Radar surveillance would also be maintained for back-up coverage. With PVOR, aircraft position could be pinpointed far more accurately than is possible under present means of control.

PART II Closer Spacing of Air Traffic Calls for New Navigation Techniques

suitable visual display, perhaps a wall screen, so that he could absorb precise information presented from several airplanes at the same time; whereas it is obviously impossible, even for an FAA controller, to comprehend two or more *voice* messages being relayed simultaneously.

The airborne computer could also be used to give the *pilot* a visual chart presentation of his computed position, so that he would know his exact geographical location at all times and in all weather.

The area navigation system concept, already tested at NAFEC, would allow the pilot to watch his progress on a map display from cruise altitude down to the runway threshold. Data from both his distance measuring equipment and his VOR receiver could enable the computer to activate a small "bug" over a plastic plate, or chart of the area of flight. A computer could also present various audio or graphic signals to the pilot which would be shorthand indications of information vital for him to know —concerning terrain, obstacles, etc.

One of the current limitations of the VOR-DME navigational system is that courses must be plotted on straight line segmented paths of flight. No matter how many VOR-DME transmitting stations you have, this limitation will always mean that there are some areas of the map into which VOR will not guide you directly, but only by circuitous means. Furthermore, aircraft approaching a controlled airport, unless cleared straight in, may be given a number of vectors by controllers while executing their approach—the more aircraft in the landing area, the more complicated the approach flight path will be.

Fewer Voice Transmissions

The need for voiced steering vectors could be eliminated, however, both at terminals and en route, by means of airborne computers linked to the NAVAIDS, since it would be a simple matter to store instructions in the computer appropriate to any desired flight path.

Thus, the digital computer linked to the VOR and DME could be used to give controllers more precise *surveillance* information and also to give pilots accurate pictorial *navigational* information. Radar surveillance would be used essentially to back up the precision area navigational system.

We will also require a swifter communication system than we have at present. There are many hours a day when our communications at busy airports could be described as saturated, when pilots cannot immediately contact the controller. With high speed aircraft, closely spaced, it is obvious that we cannot depend on this kind of communication system.

For example, a pilot making a 45-minute flight from Washington to New York today requires voice contact with a minimum of ten distinct air traffic controllers, all using different voice channels.

Multiply this single Washington to New York flight by 20,000 other instrument flights that we have every day throughout the nation and you begin to understand what is causing air traffic delays. The answer to a saturated communication system may lie with *digitized* data replacing voice communication.

Instant Identification

The same computer system in the aircraft utilized to digitize navigational information could be used to digitize transmissions of all types of information from the cockpit to the ground. A pilot's statement of identity, location, airspeed, etc., which might take him several moments to transmit by voice (once he was able to establish contact with the controller) could be relayed in digital form in a fraction of a second, and displayed to the controller in any desirable form, including graphic or visual presentation. In the event of an impending conflict or other serious situation involving inadequate separation, the computerized system could flash a warning signal to the controller in far less time than any possible voiced warning could reach him from the pilot, once the latter sensed his danger.

Where actual voice communication between pilot and controller is desirable, the use of *electronic voice switching,* which uses *discrete channels* to permit almost instantaneous connection, would be used.

So we see that it *is* possible to draw three airplanes out of the same funnel that previously contained one, without resorting to the hocus pocus of a magician pulling rabbits out of a hat. Much closer spacing will be possible with more precise air navigation and controller surveillance and a speedier communication system. Electronic aids for creating these new systems are already in existence and familiar to us. We have only to apply them effectively in a live environment.

We must realize that the price of this speeded up air traffic will have to be paid for by the users of the airspace system. But *time* has never been bought cheaply, and we should not expect to be able to do so in the air.

Oscar Bakke

Acting Deputy Administrator, FAA

Six years' service as FAA's Eastern Region Director gave Mr. Bakke first-hand experience with the problems of high density traffic hubs.

famous

FLIGHTS

FIRST TRANSCONTINENTAL FLIGHT

With grass streaming from the tailskid, Rodgers takes off on historic flight.

Given a brand new airplane, an ample expense account, $50,000 prize money as incentive, and 30 days to make the trip, the first American transcontinental solo flight should have been a breeze. But in 1911, the airplane wasn't noted for either endurance or durability, and if Cal Rodgers hadn't had plenty of both, the feat of pioneering coast-to-coast air travel would surely have awaited a much later day.

As it was, the young airman never came close to the $50,000 prize money offered by publisher William Randolph Hearst to the first man to fly across the United States, ocean to ocean, in 30 days. Although his flying time was less than 3½ days, the trip actually took *85* days, with most of the time needed for repairs to either the plane or its pilot. Together they survived thunderstorms, a race with an eagle, and 15 bone-jarring, strut-snapping crashes before the Atlantic to Pacific journey was completed.

The flight began at Sheepshead Bay, Long Island on September 17, 1911 when Calbraith Perry Rodgers, a six-foot-four former football player and one of the handful of pioneer aviators in America, took off in a canvas-and-wire contraption identified by the few who had ever seen one as an "aeroplane."

Zigzag Flight Plan

Cal's destination was Long Beach, Calif., and his planned route of more than 4,000 miles was determined more by absence of mountains and continuity of railroad tracks than by crow-flight distance or economy.

The planned flight, from Long Island to Long Beach, would take Cal through only 12 states, but he ranged as far north as Elmira, N. Y. and as far south as Del Rio, Texas. Because navigation aids were scarce in those days, he never strayed far from population centers or the railroad lines.

In fact, while it was common practice in the early days of aviation for pilots to follow the trains, Cal Rodgers had a train *follow him*. J. Ogden Armour, who sponsored the flight as a means of promoting his new soft drink called "Vin Fiz" (the Rodgers airplane was, accordingly, named the *Vin Fiz*), supplied a special railroad car and staff to accompany Cal. The train was equipped with two extra airplanes, a variety of spare parts, two complete engines, a Palmer-Singer touring car, a well-stocked first-aid center, a repair shop, and an assortment of tools. This piece of rolling stock and its equipment absorbed most of the $180,000 expense money provided by Mr. Armour.

The spares were not wasted. One strut, the rudder, and the engine drip pan were all that remained of the original airplane when it reached California.

The plane was supplied to Rodgers by the Wright brothers, who also threw in the services of their chief mechanic as a part of the deal because, as Orville said, "you sure as the world will need him." A single engine developed 35 hp for two huge propellers which drove the flimsy craft through the air at about 55 mph.

Cal Rodgers made the trip in 68 hops, traveling 4,321 miles in three days, ten hours, and four minutes of actual flying time. The history-making junket began with a 105-mile leg from Long Island, up Manhattan, and across to Middletown, N. Y.

Rodgers hope of making 200 miles a day was quickly dimmed when he caught his landing gear in a tree during take-off the second morning and crashed nose-first into a chicken coop. Sixteen men worked all through the night repairing the aircraft. And Cal paid an irate farmer's wife a good price for the chickens that came out second best in that encounter.

An electrical storm encountered over Kansas and Oklahoma was described by Cal as the most frightening part of the trip, but over Texas an eagle raced him for 12 miles between Dallas and Fort Worth. Apparently winning the race, the bird next challenged his frail-feathered friend by flying directly toward the airplane. At the last possible moment, both Cal and the eagle simultaneously changed course, not—fortunately—in the same direction.

Rodgers (right) with S. I. deKraft, before start of marathon flight. Trans-U.S.A. flight required 68 hops and 85 days from start to end.

First Airmail Flight

With the Hearst prize fading out of the picture by the time he reached the Mississippi, Cal helped meet the expenses of the trip (which cost him $14,000 over and beyond the funds the sponsor provided) by appearing at fairs or performing for the crowds that gathered in cities along the route. His was also the first transcontinental airmail flight, carrying postcards for an additional postage charge of 25 cents.

Over Texas, fuel pump trouble and a cracked cylinder forced Rodgers to glide to a landing from his 4,000-foot cruising altitude. At Imperial Junction, just inside California, he suffered the most spectacular of several near-fatal accidents when an engine cylinder exploded, driving metal splinters into his arm and crippling the airplane. This event, like numerous others before it, signalled delay but not defeat; and on November 5 Rodgers arrived in Pasadena, on the outskirts of Los Angeles.

Cigar clamped in his teeth, Calbraith P. Rodgers surveys wreckage of his plane. He was to crash 15 times in his flight from New York to California.

There he was praised by the papers, cheered by the crowds, and presented the Aero Club of America's Gold Medal for "superb airmanship" in completing the first transcontinental flight across the U.S.

But for Rodgers Pasadena wasn't the Pacific; pride urged him to touch down on the shores of Long Beach, 35 miles westward. Continuing his flight, he was forced down over Covina by a broken fuel line. Correcting that difficulty and anxious to conclude his trip, he was flying at night over Compton when the repaired fuel line clogged, the plane crashed, and Rodgers suffered two broken legs, several cracked ribs, and a shattered collarbone. Eight miles short of his goal, he was forced to wait nearly a month while he recuperated.

Finally, on December 10, Cal Rodgers dipped the wheels of the Vin Fiz in the waters of the Pacific, just as he had done in the Atlantic before leaving Long Island. For his feat he was acclaimed "king of the air" and his adventure duly recorded as a "first" in the slowly lengthening log of American aviation.

Cal survived his victory by only five months. In May of 1912 he died when a seagull flew into the controls of his plane and caused it to crash in the surf off Long Beach. He was the 127th man to be killed in trying to bring aviation to life.

John Demeter

Rodgers' famous flight is described by Charles S. Wiggin in his illustrated book, First Continental Flight *(The Bookmailer, N.Y.). A replica of the "Vin Fiz" is on display in the National Air Museum, Washington, D.C.*

Photos courtesy of Smithsonian's National Air and Space Museum. Photo, top of page 12, from the Erik Heldes-Helm collection.

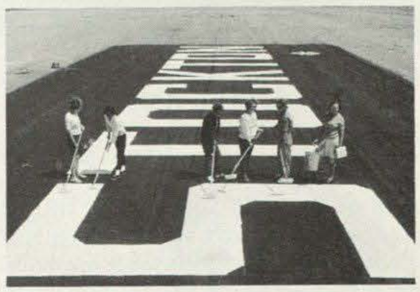
Pilot BRIEFS

• FASTER DEPARTURES, FEWER DELAYS are expected from a new FAA procedure which allows controllers to initiate intersection takeoffs. Intersection takeoffs have been permitted at the option of the pilot, although many pilots were unaware of the rule. Pilots may still use the full runway length, or elect a different intersection for any reason, provided they inform the tower of their intention. On request, tower controllers will provide pilots with the measured distance between the intersection and the end of the runway.

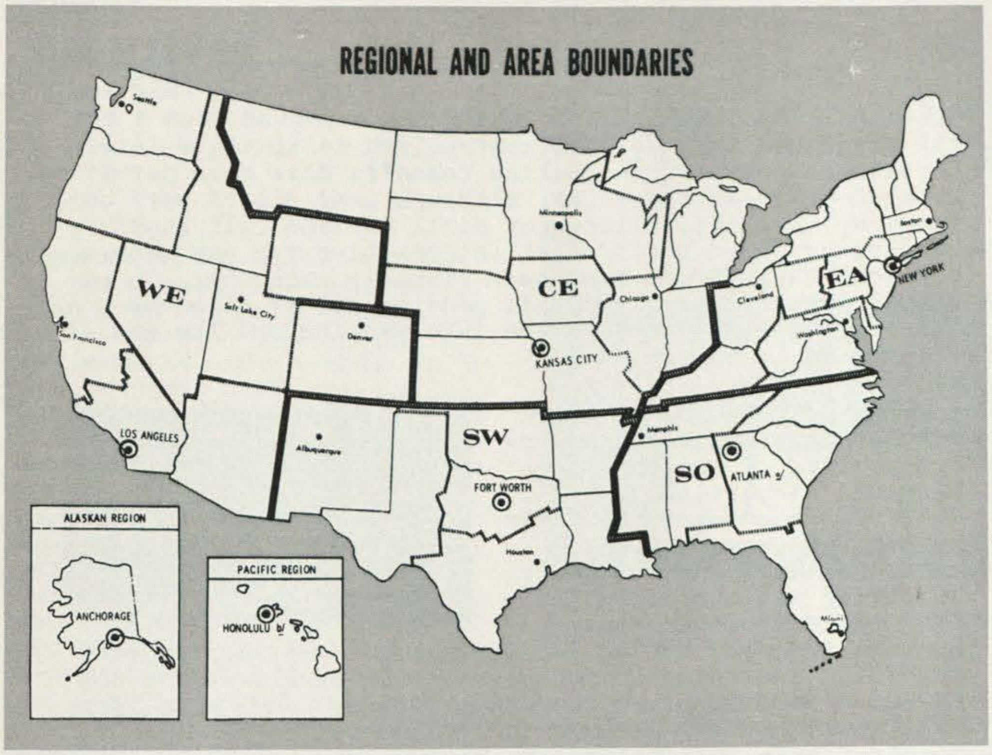
• APPROXIMATELY 300 ACRES of rental property in the northern portion of Dulles International Airport (near Wash., D.C.) has been made available by FAA for commercial and light industrial development. Utilities are available for five building sites ranging in size from 120,000 to 148,000 square feet. Additional utilities are being planned. Complete details can be obtained by writing to the Director, Bureau of National Capital Airports, FAA Department of Transportation, 900 South Washington St., Falls Church, Va. 22046.

• THE NUMBER OF HOURS REQUIRED to earn an airline transport pilot certificate would be increased from the present 1,200 to 1,500, but more credit would be given for time logged by copilots and flight engineers in air carrier operations, according to a proposed rule change. Only flight crews working for scheduled and supplemental airlines and commercial operators of large aircraft would be affected. . . . Flight engineers participating in an approved pilot training program provided by the employing airline or operator would receive one hour of credit toward the required 1,500 hours for every three flown, up to 500 hours. Copilots would receive full credit for their flying hours, instead of only 50 per cent under present rules. Comments on the notice (Docket No. 9114; Notice (68-21) should be submitted in duplicate before Dec. 9, 1968, to FAA Rules Docket, GC-24, 800 Independence Ave, S.W., Washington, D. C. 20590.

• "INTERNATIONAL SKYWAYS—CORRIDORS OF COOPERATION" is the theme of FAA's exhibit at the 1969 Paris Air Show, May 29-June 8. The agency's display will illustrate how the airplane has made the world a neighborhood by affording man greater freedom in his movement around the earth.



• THERE'S NO MISTAKING STOCKTON MUNICIPAL AIRPORT, thanks to the San Joaquin Valley chapter of the Ninety-Nines, a national organization of women pilots. FAA Tower controller picked out the location, laid out the lettering, and the ladies swung into action. Using long-handled paint rollers, they applied 10 gallons of white paint make an unmistakeable, 115-foot sign. They polished off their production with a "flower power" daisy under the "N".



Requests for FAAP grants should be sent to the nearest FAA Area Office in the agency's seven regions shown above. Correspondence should be directed to: Airport Branch Chief.

NOV. 22 IS DEADLINE FOR FY '70 FAAP FUNDS

Public agencies owning and operating airports have only until November 22 to submit requests for Federal help under the Federal-aid Airport Program (FAAP) for fiscal year 1970.

Under the FAAP program, grants are made on a cost-sharing basis, with the Federal government providing generally half of the cost of approved projects. The appropriation for FY 1970 is $30 million.

Among the projects eligible for FAAP funds are land acquisition, construction and improvement of runways, taxiways, aprons and lighting. Not eligible are projects for terminal buildings and hangars.

Urgent programs, started but not completed under prior FAA programs, will be given priority. High on the list also are requests for funds for development needed to complement facilities for all-weather operations, airport development that will assist toward relieving air traffic congestion, reliever airport development, etc.

Application for grants should be made to: Airport Branch Chief at the nearest FAA area office.

New FARS To Improve Safety In Travel Club Aircraft

Air travel club members will soon be assured the same basic safety considerations provided passengers on commercial flights.

This is the intent of a new addition to the Federal Aviation Regulations—Part 123, "Certification and Operations, Air Travel Clubs Using Large Airplanes."

The regulation will require clubs using large aircraft, such as the Super Constellation and Douglas DC-7B, to meet certification and operation rules similar to those regulating commercial airline operations.

The regulation will also cover aircrew qualifications and require up-to-date records on club policies and operational procedures, airplane performance operating limitations, flight instrumentation, navigation and engine equipment.

The new rules will prohibit air travel clubs operating large planes from continuing operations after Dec. 1, 1968, unless they have applied for an FAA operating certificate.

Under FAR 123, club aircraft will meet the same requirements as the scheduled air carriers with respect to fire resistant cabin interiors and materials, cabin lighting, exit marking and escape devices to increase passenger survivability in the event of an accident.

FAR 123 also requires club aircraft to be equipped with airborne weather radar when operating under certain weather conditions. Jet-powered planes will have to be equipped with flight and cockpit voice recorders. Flight crews must demonstrate airline pilot type proficiency.

FAA estimates there are about 50 travel clubs now operating throughout the U. S., some with as many as 2,000 members.

Altitude Alerting System Required

Approved altitude alerting systems will become mandatory equipment on all U. S. civil turbojets after Feb. 28, 1971, according to a recent FAA ruling.

The equipment must be capable of alerting the pilot as he climbs or descends to a pre-selected altitude in sufficient time for him to establish level flight at that altitude. Aural and visual signals are *both* required except for operations below 3,000 feet, when either aural or visual alone will suffice.

The 30-month lead time for installation of the signaling instruments is to allow industry adequate time to complete development of systems that will include additional safety features.

Nantucket Memorial Airport Earns FAA Beautification Award

Ladies of Nantucket's Garden Club made up one of the key forces that converted the city's airport into a prize winner in FAA's continuing campaign to stimulate airport beautification.

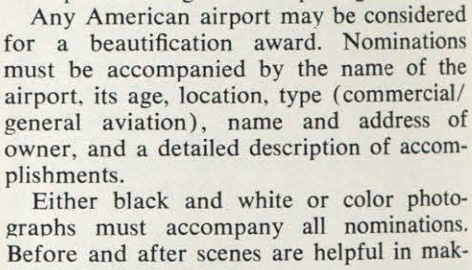
Of the nearly 10,000 U. S. airports, Nantucket Airport was the ninth to receive an award in FAA's Airport Beautification Program, which began in June 1967.

The Certificate of Commendation, signed by (former) FAA Administrator William F. McKee, read: "To the Nantucket Memorial Airport for taking a lead in the National Airport Beautification Program by illustrating that an aerial gateway can also be a center of culture and beauty. In so doing, the community has created a keystone of civic pride and hospitality warranting the admiration and appreciation of all who pass through the airport gates."

Any American airport may be considered for a beautification award. Nominations must be accompanied by the name of the airport, its age, location, type (commercial/general aviation), name and address of owner, and a detailed description of accomplishments.

Either black and white or color photographs must accompany all nominations. Before and after scenes are helpful in making selections.

All nominations should be sent to the Director of Information Services, Federal Aviation Administration, 800 Independence Ave., S.W., Washington, D. C. 20590.



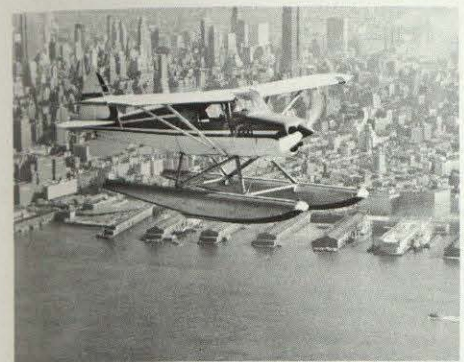
Nantucket Memorial Airport's terminal combines classic New England architecture with modern control cab. Rock garden adds charm.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• Seeks Seaplane Rating

What regulations pertain to obtaining a seaplane rating, and the requirements for maintaining such a rating. Also, I would appreciate receiving any other general information you have on float plane flying, and specific information on performance of float-equipped Cessna 150 and 172 aircraft.

John V. Cronin
Overland Park, Kansas



FAR 61.17(h) is the regulation that applies. It details all the requirements. Additional information is contained in Advisory Circular AC 61-3B, "Private Pilot, Airplane, Single Engine," obtainable for 20 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Specific performance data on Cessna aircraft is obtainable from the factory at Wichita, Kan.

In case you missed it, we are sending you a copy of the June 1966 FAA Aviation News which contains the article, "Flying Floats."

• Knots To You

Wilbur Blumenshine, in the August issue of Aviation News, suggested that the aviation community be surveyed on the question of knots or miles. He put his $20 on mph.

I personally prefer knots, but that's not why I'm writing. Regardless of which measurement we use, let's use it all the way, and that goes for airway width, control zone size and visibility distance as well.

Jeremiah Randall
Atlanta, Ga.

• Opportunity Knocks

I wonder if any fixed base operator has ever considered buying survival kits and crash locator beacons and renting them to pilots who plan to fly over remote areas?

I've never heard of such a service, but I feel it would be profitable for the FBOs, and a valuable service to their customers. Both the beacon and survival gear might be contained in one unit. And, carrying such gear might lower insurance premiums too.

J. F. Burton
San Diego, Calif.

A substantial number of pilots have inquired about the availability of rental crash locator beacons and survival kits.

Informal inquiries to operators in or near remote, mountainous, and coastal areas have uncovered only an occasional demand for rental crash locator beacons. However, there are several coastal airports where pyrotechnic signaling devices and approved flotation gear are available on a lease basis. This equipment is required for overwater operations for hire beyond power-off gliding distance from shore. As a result of this requirement, there is considerable demand for rental service in coastal areas.

• Our Gimlet-Eyed Readers

Granted, there are a few items I missed on the preflight quiz, but there also seems to be one that you missed. The bottom left photo shows a control lock chain in place on the pilot's yoke.

W. T. S. Montgomery, Jr.
Jacksonville, Fla.

Your photo-quiz failed to mention placing the windshield wipers in the proper parked position out of view where they would not obstruct the pilot's vision during take off. Also, you fail to mention removing the oil drip pan under the right engine prior to flight. The possible damage as a result of prop wash lifting the pan seems obvious.

John McCrea III
Arcadia, Calif.

In your photo pre-flight quiz there appears to be a rubber band stretched across the top of the pilot yoke, probably placed there to hold approach plates. However, it does constitute an obstruction to vision, and may possibly obscure either low placed instruments, or the position of switches located low on the instrument panel.

Robert L. Wick, Jr., M.D.
Ohio State University
Columbus, Ohio

Guilty on all points. The oil pan, however, was intentional. We wanted to depict excessive oil leakage, but did not want to mess up the ramp. So we left the pan in place, assuming that readers would understand that the pan would be removed before engine run-up.

• Businesslike Approach

I am interested in starting my own business in some phase of flying. Where could I find the most complete information and statistics available to help me decide? In particular, I'm looking for a breakdown of the various flying operations, and projections for future needs. I would be grateful for information on geographical number densities, grow trends, etc.

Rosenberg, Texas

Two excellent sources of aviation business information, "Aviation Forecasts, Fiscal Years 1968-1979" and "Scheduled Air Taxi Operators as of October 1967", have been sent to you.

A visit to aviation facilities, including public and private airports, and manufacturers of aircraft and equipment, is suggested to provdie first-hand knowledge of the aviation industry. Your local library is another source of information. Most libraries stock technical and trade magazines and newspapers, or can provide you with the names of such publications relating to aviation.

• Mechanic's Bible

The C. A. M. 18 used to be called the mechanic's "Bible." It has long since disappeared, I know, but what has replaced it, how much does this replacement cost, and where can I get a copy?

Lloyd W. Turnipseed, Jr.
Washington, Iowa

Civil Aeronautics Manual 18 long ago entered the "rare books" category; those who still have a copy never let it out of sight.

It has been replaced by two completely rewritten publications, available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Advisory Circular AC 43.13-1, "Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair" costs $1.50, and Advisory Circular AC 43.13-2, "Acceptable Methods, Techniques, and Practices—Aircraft Alterations" costs $1.00 (add 25 cents for foreign addresses).

• Flying Fire Truck

The July issue of Aviation News (which I enjoy greatly), had an article on Canadian fire fighting water bombers. I would like to get more information on this type of aircraft, and its use. I understand it is used in the U. S. as well as Canada.

My thought is to convert a Grumman J2F-6 *Duck* to fire fighting use if it is economically feasible.

Gerald L. Breuner
Orinda, Calif.

You can get full information on the Canadian Canso *(modified Consolidated PBY* Catalina *of WW II) and its conversion to a water bomber by writing to: Director, Information and Technical Services, Department of Forestry and Rural Development, Sir Guy Carleton Bldg., 161 Laurier Ave., West, Ottawa, Canada.*

Additional information on the use of aircraft in fire fighting is available from: U. S. Forest Service, Division of Fire Control, South Agriculture Building, Washington, D. C. 20250

The U. S. Forest Service has experimented over the years with a wide variety of aircraft for fire fighting. Almost without exception, they are WW II craft. All are used by the Forest Service on a contract basis.

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